Corn & Soybean

Insect ID Guide

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Insect ID Guide

Corn

Soybean

Corn

Common Stalk Borer

Common stalk borer (*Papaipema nebris*) is a sporadic and infrequent pest of corn in much of North America. Damage to corn is most common near field borders, waterways, or terraces, and in continuous corn.

Timing and Host Plants

Development begins in grasses, but larvae move at about 1400 -1700 GDU (base 41°F) to larger hosts, including nearby corn. Primary hosts are corn, quackgrass, giant ragweed, wirestem muhly, tomato, and occasionally soybeans.

Crop Damage

Stalk borers tunnel into corn stalks above the soil or climb directly into the whorl resulting in tattered leaves. Young plants (VE-V3) may be killed by tunneling below the growing point. On older plants (V4-V8), the leaves will usually discolor, wilt, and die if tunneling is between them and the growing point; often called "dead heart."

Plants infested after the V8 stage usually show little visible injury. Non-lethal infestations in early-stage plants cause stunting, tillering, delayed development, and increase frequency of barren plants, reducing yield.

ABOVE: A stalk borer tunneling in a corn plant.

RIGHT: Dead whorl leaves suggest that a stalk borer larva has tunneled into the stalk and hit the plant's growing point.

Stalk borer larvae can be distinguished from other larvae by the black stripe on the side of the orange head. Early-stage larvae also have a single cream-colored stripe down the back and a broad purple band on the first four abdominal segments. As larvae grow, the purple band becomes dilute and faded.

Identification

Stalk borer larvae are cream to light brown with a dark purple saddle on the forward half of the body. Larvae have dark streaks on either side of their heads. As larvae grow, the purple becomes dilute and faded. Larvae are about ½ inch long when they leave grass and will reach nearly 2 inches at full development before fall.

Scouting and Management

- Scouting should be prioritized in grassy or weedy field edges, such as shelterbelts, terraces, waterways and in no-till fields with heavy vegetation prior to burn down.
- Tillage or herbicide grass control in the prior fall will reduce ovipositional attractiveness.
- Begin scouting at about 1300 GDU (41°F base) accumulation since January 1.
- Resistance is available as several available Bt corn technologies provide control or suppression of common stalk borer larvae.
- Insecticide use is most effective if timed when larvae are leaving host plants. Spray only infested areas of the field.
- On corn plants up to V6, less than 10% infestation may warrant spot treatment, later than V7 nearly 100% of the plants must be infested to warrant treatment.

Corn Earworm

Corn earworm (*Helicoverpa zea*) is a pest of field corn, sweet corn and several other crops throughout much of North America. Populations do not usually overwinter in most of the Corn Belt and must re-infest each year.

Lifecycle

Corn earworm overwinters in southern areas of the U.S. and immigrates on weather fronts before laying eggs in host crops. Eggs are laid in early to mid-summer and hatch in 3-4 days at an average temperature of 77°F. Larvae feed on whorl stage corn for 3 to 4 weeks before burrowing in the soil to pupate. Two full generations can develop each season, with populations peaking in late summer.

Identification

Corn earworms are found in many colors, ranging from light green or pink to dark brown or black. Larvae have alternating light and dark stripes and a light underside. A distinguishing feature is the presence of tubercles with two or three large hairs on each.

Corn earworm larvae have two narrow, white stripes on the pronotum (older larvae may also have a third narrow stripe along the middle of the pronotum), numerous black tubercles (warts) — each with a stiff seta (hair), and the entire body is covered with thousands of small microspines, giving the skin a rough texture. The head is frequently freckled orange, or occasionally green.

Corn earworms are found in many colors, from light green or pink to dark brown or black.

The corn earworm adult is a buff colored moth with a lighter and darker band near the wing tips. The eyes are green in living specimens.

Crop Injury

Corn earworm has a large range of hosts including corn, cotton, tobacco, tomatoes and other fleshy fruits and vegetables. In addition to the ear, larvae can occasionally be found in the whorl and foliage on younger plants.

Corn earworms are cannibalistic and normally only one will be found per ear. They will frequently be near the tip but may feed down the ear creating a track of damaged kernels. The injury creates an ideal environment for ear fungi to invade and may lead to quality problems at harvest.

Corn earworm larvae are notoriously cannibalistic, but occasionally two or three larvae may be found in the same ear.

Management

Light traps or pheromone traps can indicate when adults are flying. Scouting can be done in the field by looking for eggs on the green silks and turning back the silks at the tip of the ear to look for larvae. In field corn, insecticide use is rarely warranted. Because the larva is exposed outside the ear for only a short time, economical timing of insecticides is difficult. Tight husks give some protection, but real resistance is only available with Bt hybrids.

Corn earworm (Helicoverpa zea) will also feed on soybeans in which case it is called the soybean podworm.

It is also known as the cotton bollworm, sorghum headworm and tomato fruitworm.

Corn Rootworm

Corn rootworm is the most damaging insect pest of corn in North America. Corn rootworm populations have proven adaptable in overcoming control methods, making it important to employ best management practices and use multiple control tactics.

The western corn rootworm *(Diabrotica virgifera virgifera)* and northern corn rootworm *(D. barberi)* are the two most damaging species to corn in the Midwestern U.S. and in Canada. Mexican corn rootworm (D. *virgifera zeae)* is a pest of local importance in Oklahoma and Texas, and southern corn rootworm *(D. undecimpunctata howardi)*, is found throughout the U.S., but rarely causes economic levels of damage.

The corn rootworm larva has a brown head and an oval, dark brown plate at the rear end.

Northern (left) and western (right) corn rootworm adults.

Lifecycle

Western and northern corn rootworm go through one generation per year. Larvae begin hatching from late May to early June in most areas of the Corn Belt. The larvae pass through three stages, or instars, before pupating in the soil. Adult rootworms begin to emerge from corn fields in late June and early July. Rootworm beetles disperse and mate, and can feed on pollen, green silks, or leaves in corn fields. Rootworm beetles can move between fields and may feed on corn in fields other than where they emerged. Female beetles deposit eggs in the soil from mid-summer until autumn where the eggs overwinter.

Crop Damage

Laval feeding on the roots reduces the plant's capacity to take up water and nutrients. A damaged root system can also predispose the corn plant to fall over in wet or windy conditions. Often this lodging occurs prior to tasseling, and the plant attempts to grow upright, causing a tangled condition known as "goose-necking". Injured roots are also easy entry points for fungi and bacteria that may increase severity of root and stalk rots and premature death.

Adult corn rootworms feed on green silks and can prevent silks from capturing pollen. In commercial corn fields, large beetle populations are necessary to cause economic damage and to justify an insecticide application. Western corn rootworm beetles can also cause damage by feeding on the green tissue of the leaves.

Heavy corn rootworm feeding damage to roots of an unprotected plant. Larval feeding on roots reduces the plant's ability to take up water and nutrients and can lead to root lodging.

Root lodged corn field under high corn rootworm pressure. Severe root lodging often results from root feeding by corn rootworm larvae, followed by summer storms. Plants still in vegetative growth stages will bend upward following lodging, a response commonly called 'goose-necking.'

Close-up of corn rootworm feeding on a root. Typical rootworm feeding behavior is to feed externally on the roots, eating a groove or channel into the tissue. The injured portion of the root then turns off-color.

Heavy feeding of northern corn rootworm beetles on corn silks. Beetles may aggregate on corn ears and chew the silks off below the tip of the husk, inhibiting pollination of all the kernels.

Western Corn Rootworm

Has three stripes, or one broad stripe, on the wing covers. The legs are partially black but not banded.

Northern Corn Rootworm

Solid green color. Newly emerged adults may be tan or light yellow in coloration. No stripes or spots on the wing covers.

Southern Corn Rootworm

Also known as the spotted cucumber beetle. Has a black head, green pronotum, and 12 black spots on the yellowish-green wing covers.

Mexican Corn Rootworm

Legs are dark colored. Wing covers are often a mixture of yellow, green, and light blue and lack distinctive stripes.

Identification

Corn rootworm larvae are slender, less than ½ inch long, and white with a dark brown head. A dark brown plate on the top of their rear section gives them a doubled-headed appearance. Corn rootworm species are indistinguishable from each other during the egg and larval stages.

Corn rootworm adults are easily distinguishable from each other by color and patterns on their bodies.

Management

Corn rootworms have a history of adapting to and overcoming control tactics, which can make management very challenging. No single tactic can be relied upon to provide complete protection against corn rootworm, however crop rotation, Bt traits, soil insecticides, insecticide seed treatments, and insecticide treatments targeted to adults can all be effective tools for managing corn rootworm populations when used as part of an integrated management strategy.

Corn Rootworm Best Management Practices

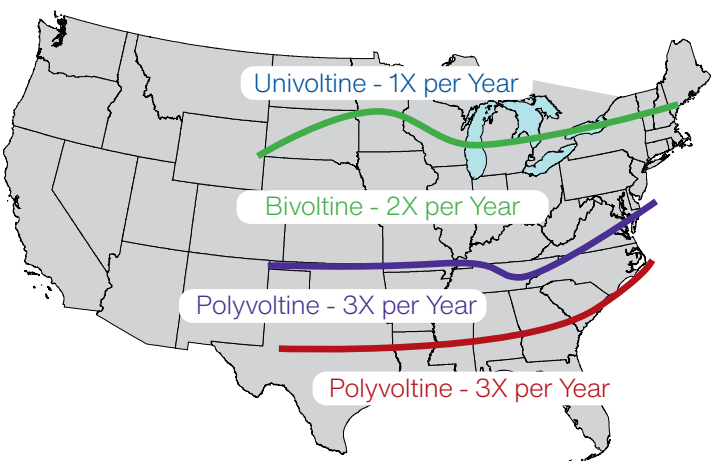
1. Proactively lower corn rootworm populations:
   - Build in a crop rotation every 3 years.
   - Use an adult control program (using appropriate thresholds and timing).
2. Use of non-Bt corn with a soil-applied insecticide can be very effective (especially if CRW populations are at low to moderate levels).
3. In situations with high CRW pressure, consult with a local expert regarding these options in combination with Bt corn.
   - Use a high-rate insecticidal seed treatment (1250 rate).
   - Use of a soil-applied insecticide with Bt corn is not recommended for control except in limited circumstances. Consult with your Pioneer agronomist, extension service, crop consultant or other local experts for further guidance.

European Corn Borer

European corn borer *(Ostrinia nubilalis)* was once one of the most destructive pests of corn in North America; however, it's impact has declined with the widespread adoption of Bt corn. However, populations are still present, and outbreaks can still occur and cause significant yield losses in unprotected corn.

Lifecycle

European corn borer can produce one generation per year (univoltine) or multiple generations (bivoltine or polyvoltine) depending on the length of the growing seasons. Most corn acres in North America lie within the region affected by two generations. Northern regions of the Corn Belt may be affected by both univoltine and bivoltine populations; the proportions of which can vary from season to season based on growing conditions.



European corn borers overwinter in corn stalk residue as full-grown larvae. Larvae pupate and emerge as moths, usually in late May or early June in the central Corn Belt. Adults fly to grassy areas to mate and then to selected corn fields to lay their eggs.

Bivoltine larvae will pupate inside the stalk during July and early August. Second generation adult emergence and egg laying begins during late July and continues through the end of August. In the fall, fifth instar larvae will enter diapause and overwinter inside the stalks.

Identification

European corn borer larvae can be distinguished from other corn caterpillars by their dark brown or black head and lack of distinctive spots or stripes. Mature larvae are about ¾ to 1 inch (19 to 25 mm) long, dull white to grayish in color, and have small brown halo-shaped spots running the length of the body.

A late-stage European corn borer larva has a dark reddish brown or black head, and the dorsal side of each abdominal segment has two "halo" spots with a dark seta (hair) inside each halo.

The head of a European corn borer larva is typically black or dark reddish brown in coloration.

Corn borers have spots on the dorsal surface that resemble "halos," each with a stiff dark seta (hair).

Crop Damage

The main damage caused by European corn borer is due to tunneling in stalks, ear shanks, and ears. Tunneling disrupts water and nutrient transport in the plant and increases risk of stalk lodging and ear drop. Damage may allow higher levels of stalk rots and ear molds. The magnitude of the yield reduction due to corn borer tunneling depends primarily on the growth stage of the corn plant when attacked, the growing environment, and hybrid tolerance or resistance.

First instar larvae will feed on young, developing leaf tissue without eating all the way through the leaf, resulting in injury patterns referred to as "window paning." As larvae develop, their feeding will penetrate completely through the leaf, leaving a random "shot hole" feeding pattern. Third instar larvae will begin feeding in the whorl before boring into the stalk.

Larvae will go through the fourth and fifth instars inside the stalk, completing their growth about three weeks after hatching.

Newly-hatched second generation larvae generally feed on the leaf axil close to the stalk and on pollen that has collected in the leaf axil. Second generation larvae do not begin feeding on the stalk of the corn plant until the fourth instar, due to the hardness of the maturing stalks. Second generation larvae feed on the tassel and ear shanks which can result in ear drop.

Newly-hatched European corn borer larvae will feed on young, developing leaf tissue without eating all the way through the leaf.

Larvae that tunnel into a corn plant often expel frass (fecal material) from the entry hole in the stalk.

A European corn borer larval tunnel within a cornstalk may cause the stalk to break during high winds.

The adult male (left) is smaller with darker bands than the female (right), which is a lighter buff color.

Management

Scouting to determine infestation levels and timing of larvae activity is critical for effective management in non-Bt corn. The ideal window of treatment will only be about 4 to 6 days and, once larvae are in the stalk, insecticide treatments will be ineffective. Trapping of moths during mating can be a helpful tool to guide field scouting. Black light and pheromone traps can both be used to monitor moth activity.

Begin scouting fields for signs of shot holes in the leaves about 200 heat units after corn reaches 18 inches (46 cm) in height. Moths and egg laying may be concentrated along field edges, and grass waterways, so sampling along these edges will not provide an accurate estimate of the field population. Egg mass counts are the preferred method of scouting for second generation European corn borer. Begin scouting for egg masses in corn when corn borer moths are being collected in light or pheromone traps. Properly timed insecticide applications can provide effective control of first-generation European corn borer. Managing the second generation is more difficult; an insecticide treatment will likely provide around 65% control. Bt corn has been and continues to be a very effective management tool providing protection against European corn borer.

European corn borer egg mass on a corn leaf.

Fall Armyworm

Fall armyworm *(Spodoptera frugiperda)* is an occasional pest of corn in the Southern U.S. and Texas. Fields planted to non-Bt hybrids, as well as late-planted and late-maturing fields, are at greatest risk for injury. Feeding typically occurs in whorl-stage corn. Larvae can survive on at least 80 different plant species.

Lifecycle

Native to tropical regions, fall armyworm overwinters in the southern U.S. and can migrate to northern states. One generation completes its life cycle in 30 days with eggs hatching within four days. Adults can be found from mid to late summer and larvae can still be active in the fall. Rate of development is dependent on temperature. Fall armyworm development is favored by droughty conditions.

Crop Damage

Initial injury symptoms are similar to those of European corn borer. Early-stage larval feeding causes "window paning" and shot holes in leaves. Late-stage larval feeding causes elongated, ragged holes and may cut leaves in half. Yellowish-brown frass that plugs the whorl is also an indication of fall armyworm presence. Fall armyworm can injure the developing tassel in VT stage corn, but the most common damage is to late pretassel corn. As plants begin to tassel, larvae may begin to feed on young ears.

Fall armyworm larvae have 4 black tubercles (warts) on the dorsal side of each body segment. The tubercles form a "square" pattern near the posterior end. There is a lighter colored lateral stripe running the length of the body just above the legs.

Fall armyworm larva.

Fall armyworm adult.

Fall armyworm feeding damage.

Identification

Early larvae are pale green with dark heads that turn an orange-brown color. Fully grown, larvae are 1.5 inches in length and range in color from pale green to black. Fall armyworms can be distinguished from similar corn caterpillars by two physical characteristics:

- Inverted "Y" pattern on the front of a dark head
- Dark spots (tubercles) on dorsal surface arranged in "square" or "trapezoid" pattern

Mature moths are approximately 1.5 inches wide with light to dark grayish-brown forewings with light and dark splotches. The hind wing is silver-white with dark lining on the margins.

Management

Bt traits can provide good to excellent protection against fall armyworm. In non-Bt corn, Consider insecticide application when 20% of whorl-stage plants are infested with live larvae. Only larvae in whorl-stage corn can be controlled with insecticides; larvae in corn ears are protected. Scouting for fall armyworm should be done in the early morning or late afternoon when larvae are most active.

Japanese Beetle

Native to Japan, the Japanese beetle *(Popillia japonica)* was first found in the United States in 1916 near Riverton, New Jersey. Since then, populations have spread throughout much of the eastern half of the U.S. Most damage to corn is from adult feeding; however, the larval grub also can feed on roots. Late-planted fields are at greater risk of feeding injury. Japanese beetles are often found around field edges or areas of delayed growth. Adults will feed on a vast array of plant species, including corn, soybean, ornamentals, fruit trees, grapes, and weeds.

Lifecycle

Japanese beetles go through one generation per year. They overwinter as ¾ grown larvae deep in the soil. Larvae become active in the spring and feed on roots until they pupate in May-June. After about 2 weeks, adults will emerge from the ground. Mating and egg laying takes place during July and August.

A Japanese beetle feeding on a corn leaf.

Crop Damage

Japanese beetle damage is usually concentrated along field edges, so feeding damage visible at the field edge may not extend into the field interior. Japanese beetle adults feed on corn silks. Intense feeding during pollination may reduce pollination and yield. Skeletonized or lacy leaf patterns between veins are symptoms of either corn or soybean leaf feeding. Leaf feeding is typically insignificant in corn. Leaf feeding may be more significant in soybeans, causing defoliation prior to pod fill.

Japanese beetle grubs can be distinguished from grubs of other species by their three pairs of thoracic legs and absence of abdominal legs.

Japanese beetles clustered on corn silks to feed and mate. Extensive beetle feeding on corn silks can result in poor pollination and yield loss.

Identification

Adults are around a half-inch long, shiny metallic green with bronze wing covers, with six white hair tufts on each side of their abdomen. Larvae are almost 1.5 inches long with an orange-brown head and a creamy white body with brown hairs. Distinguishing characteristics are the three pairs of thoracic legs and absence of abdominal legs.

Management

Adults prefer lighter soil for egg laying. First entry into an area is usually near transportation, such as railroads or major highways. There are no significant natural enemies in the U.S. No transgenic or native resistance is available for either soybeans or corn.

Scouting should begin in corn in July and August and switch to soybeans during August. Use percent pollination and presence of uncut silks as a guide when deciding treatment of corn. Leaf feeding is rarely significant in corn. Use percent defoliation and amount of pod fill remaining to help decide economics of insecticide treatment for soybeans. Trapping is NOT recommended as it has a tendency to attract more beetles.

Southwestern Corn Borer

Southwestern corn borer *(Diatraea grandiosella)* occurs in southern corn regions from Arizona to western Georgia and northward to south-central Kansas, southern Illinois and southern Missouri. Yield impact is primarily due to stalk tunneling. Kernel feeding can lead to increased ear molds and aflatoxin levels in grain.

Lifecycle

Southwestern corn borers go through two or three generations each year depending on elevation and latitude and overwinter in the larval stage. Larvae pupate in the spring inside corn stalks at the base of plants. Moths emerge from the stalks, mate, and lay eggs in late May to early June. Females lay up to 400 eggs on leaves, stalks, and ear husks. Eggs hatch in 4 to 7 days. Early-stage larvae feed in corn whorls, behind leaf sheaths, or on husk leaves, ear shoots, and kernels. Late-stage larvae tunnel into the stalk. Overwintering (diapause) larvae crawl to base of stalk, tunnel inside, and create an internal girdle.

The summer stages (bottom) of the southwestern corn borer have a light reddish-brown head and 10 dark spots on each segment in the middle of the body. The overwintering stage (top) is milky white in color with no distinguishable spots.

Southwestern corn borer eggs.

Southwestern corn borer moth.

Crop Damage

Vegetative Stage Corn – First- and second-stage larvae feed 9 to 10 days in whorl, creating pinholes and small, circular lesions or "windows" to large elongated holes. Third-stage larvae depart the whorl, crawl down the plant, and burrow into the stalk. Tunneling may damage the growing point, causing "dead heart" and stunted plants. Large larvae tunnel vertically in the stalk.

Reproductive Stage Corn – Early-stage larvae feed between husk leaves, on ear shoots and behind leaf sheaths. Late-stage larvae may feed on kernels, but eventually tunnel into the stalk.

Identification

Eggs are flat and oval, laid in clusters; pale yellow-green when first laid, but within 36 hours develop three orange-red lines. Summer phase larvae are creamy white with large, raised brown or black tubercles on each body segment, and black (instars 1 to 3) or reddish brown (instars 4 to 6) heads. Winter phase larvae are creamy white but without distinctive spots. Adults are dull-white or buff-colored moths with a wingspan of ¾ to 1½ inches (19 to 38 mm).

Management

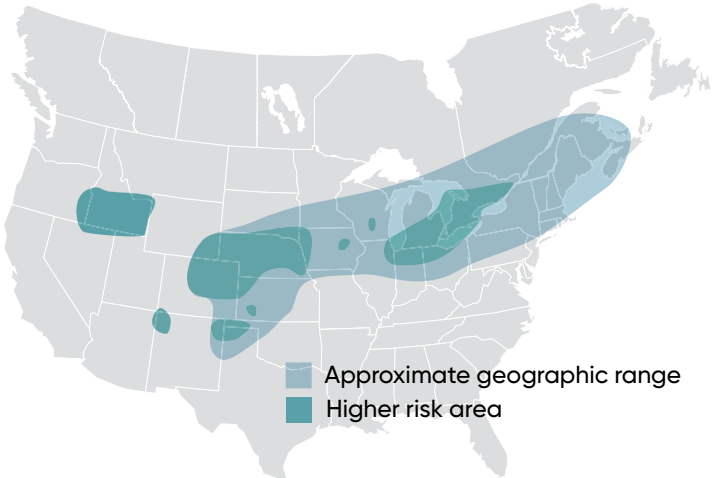
Multiple Bt traits are available that provide in-plant protection against southwestern corn borer. Economic threshold for insecticide treatment in non-Bt corn is 20 to 25% of plants infested with eggs or young larvae. Pheromone traps can predict moth flight and time to scout. Application of insecticide must occur before larvae tunnel into the stalks.

Western Bean Cutworm

Western bean cutworm *(Striacosta albicosta)* has historically been a secondary pest of corn; however, in favorable environments it can cause significant economic damage. In addition to yield loss, a major consideration for areas with higher ear rot pressure is the risk of reduced grain quality resulting from western bean cutworm feeding.

Lifecycle

Western bean cutworms complete one generation per year. Individuals go through five life stages: egg, larva, prepupa, pupa, and adult (moth). Following adult emergence and mating in mid-summer, eggs are laid primarily in the top half of the canopy on the upper surfaces of new whorl leaves in corn. Over five to seven days, eggs progress from white to tan then purple/grey just before hatch. First instars consume the eggshells, thus making post-hatch identification of egg masses difficult. Pre-tassel, first instars move up the plant to the tassel to feed on pollen before moving back down the plant where they enter the ear either through the tip or boring through the side to feed on kernels. Post-tassel, first instars may immediately bore into the ear to feed on developing kernels. Mature larvae drop off the plant and burrow into the soil where they overwinter as pre-pupae.



Approximate geographic range of western bean cutworm. Western bean cutworm was first recognized in the early 1900s as a pest of dry beans in the Western U.S. but has since become a pest of corn and expanded its range eastward.

Crop Damage

Major larval feeding coincides with ear development. Injury to plants includes leaf and whorl feeding by small stage larvae, ear penetration and kernel damage by large stage larvae. Direct feeding on the ears reduces grain yield. Infestations of several larvae per ear can reduce grain yield up to 15-20%. Feeding may allow mold and other fungal spores to colonize the ear, further reducing grain quality and potentially producing mycotoxins.

Identification

Western bean cutworm larvae are dark brown when they are young but lighten to a dull gray or pinkish brown as they mature. Fully grown larvae are around 1.5 inches in length. Western bean cutworm can be distinguished from other ear-feeding larvae by the two black bands on the pronotum behind the head and the lack of distinct stripes and black tubercles on the body. Unlike corn earworm, larvae are not cannibalistic, so several may feed on the same ear.

Western bean cutworm larvae (two left) fall armyworm (two right).

The western bean cutworm moth is about ¾ inch long with a wingspan of about 1 ½ inches. It is brown with creamy white colored hind wings. The western bean cutworm moth is identified by the cream-colored bar on the front edge of the forewing, which is joined by two spots—one circular, or oblong, and the other 'boomerang-shaped'.

The western bean cutworm adult is identified by the cream-colored bar on the front edge of the forewing, which is joined by two spots—one circular, or oblong, and the other 'boomerang-shaped'.

Management

Use pheromone traps to determine when to start scouting for eggs; usually during the VT to R2 stages. Check the upper flag leaf for egg masses after traps indicate moth flight; check 40 plants per field.

In-plant protection against western bean cutworm is available. Corn hybrids with the Vip3A Bt protein provide an effective mode of action for western bean cutworm.

Insecticide application may be necessary in corn without in-plant protection. Multiple extension organizations recommend insecticide treatment when 5% of plants have egg masses and/or young larvae. Application should be timed to coincide with egg hatch. Larvae must come into contact with the insecticide before entering the ear. When larvae enter the ear, they are less likely to encounter the insecticide and control will be reduced. Protection is most effective when egg hatch occurs during pollination. When egg hatch occurs at brown silk stage or later, the larvae can move quickly to the ears since fresh pollen is not available on which to feed.

Soybean

Bean Leaf Beetle

Bean leaf beetle *(Ceratoma trifurcatais)* a pest of soybean in most soybean growing regions of the United States. There may be three generations in the Southern U.S., two generations in the central Corn Belt and only one generation in the northern Corn Belt. Adults feed on cotyledons, leaves, and the external surface of pods.

Overwintering adult bean leaf beetles will feed on cotyledons, leaving small pock marks. Rarely will they consume the entire cotyledon.

Lifecycle

Overwintering adults emerge in early April and colonize early emerging soybean, feeding on the cotyledons, stems, and leaves, and begin laying eggs. Eggs are laid in the upper two inches of soil and hatch in 4-14 days depending on soil temperature. Larvae feed on roots in the soil and pupate in around 23 days. Pupation is completed in about a week and adults emerge from the soil. First and second-generation beetles feed on soybean leaves. As the leaves mature, beetles will move to feed on the green tissue of pods.

Crop Damage

Impact from larvae is unknown but thought to be insignificant. Leaf feeding from adults causes little impact unless defoliation exceeds 25%. Pod feeding results in greatest damage and affects both quality and yield. Adults also transmit bean pod mottle virus, which can reduce soybean yield and quality and cause green stems at harvest.

Soybean leaves with bean leaf beetle feeding damage.

Adult bean leaf beetles will feed on the outer pod tissue but not on the seed.

Identification

Larvae are found in soil near roots and resemble corn rootworm larvae, with white bodies and dark brown/black heads. Bean leaf beetle adults are ⅛ inch long. Color is typically dark yellow but may be orange or red. Wing covers often have four rectangular marks but may have two or no marks. The key identifying characteristic is the black triangle behind the pronotum (neck region).

Bean leaf beetles vary in color and marking on the wing covers. The only consistent identifying characteristic is the black triangle behind the head.

Management

If the field has a history of bean leaf beetle injury, consider planting slightly later after most adults have moved away from the area.

Early Pod Fill Stages (R1-R3) – If defoliation approaches 20 to 25% and large numbers of beetles are present, consider insecticide application, especially if beetles exceed 20 per 20 sweeps of a net.

Late Pod Fill Stages (R5-R7) – If pod injury is above 10% and beetles exceed 3 per sweep, consider insecticide application, especially if other pod feeding insects (grasshoppers) are present.

Soybean Aphid

Soybean aphid (*Aphis glycines* Matsumura) was first detected in North America near Lake Michigan during the 2000 growing season, and quickly spread to become a major insect pest of soybeans. Annual population levels are determined primarily by weather and interactions of aphids with their natural enemies, particularly the multi-colored Asian lady beetle and *Entomophthora* fungi.

Soybean aphids on a soybean stem.

Winged soybean aphid.

Lifecycle

Soybean aphids overwinter as eggs on a woody shrub species known as buckthorn. The eggs hatch in the spring into wingless types, which establish on buckthorn for two generations. The third generation emerges, produces wings and migrates to soybean fields and other acceptable hosts in late May to early June. Other hosts include alfalfa, crimson clover, red clover, and snap bean.

All spring and summer offspring are female, are born pregnant, and give live birth. Birth rate is 3 to 8 per day for 10 to 40 days. Generation time is typically 7 to 10 days. Populations can double in 2 to 3 days. Soybean aphids can produce up to 15 generations during the summer on soybeans before migrating back to buckthorn in the fall as winged females. Once on buckthorn, winged females give birth to wingless females, which mate with males developed on soybeans to produce the overwintering eggs.

Crop Damage

Soybean aphids have needle-like sucking mouthparts, which they insert into soybean tissues to remove plant sap. From the seedling stage until blooming, aphids colonize tender leaves and branches of the plant. Later, the aphids move to the middle or lower parts of the plant and tend to colonize the underside of leaves as well as the stem. If aphid numbers are high, leaves may become yellow and distorted, the plant may become stunted, and plant parts may be covered with a dark, sooty mold. Yield losses often accompany these symptoms.

Identification

Soybean aphids are small, yellow aphids with distinct black cornicles ("tail-pipes"). At only 1/16th of an inch long (the size of a pinhead or smaller), they cannot be distinguished from other aphids with the naked eye. The soybean aphid is the only aphid in North America known to extensively colonize soybean fields.

Management

Begin scouting when soybeans are in the late vegetative stages (usually late June/early July in Midwest states). Growers should continue their watch through pre-flower and flowering stages and treat if aphids reach the economic threshold. The most used economic threshold for the R1 to R5 growth stages is 250 aphids per plant if populations are increasing.

Soybean aphids on soybean leaves.

Soybean Gall Midge

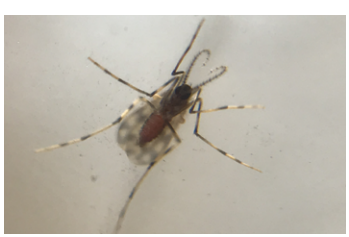
Soybean gall midge *(Resseliella maxima)* is a new insect pest of soybeans first found in Nebraska in 2011 that has now spread to parts of Iowa, Missouri, South Dakota, and Minnesota. Gall midge injury in soybean is a result of larval feeding, which occurs near the base of the plant. Prolonged feeding can cause the stem to break.

Lifecycle

Soybean gall midge undergoes complete metamorphosis, with egg, larva, pupa, and adult stages. Gall midge larvae overwinter in larval cocoons in the soil. Timing of adult emergence from the soil varies by geography with first adult emergence observed in mid-June in Nebraska and early July in Minnesota. Adults have a long emergence window. Adults live three to five days and do not feed on soybean plants. Females lay eggs in cracks and fissures in soybean stems. Newly hatched larvae feed under the epidermis of the stem and go through three instars. Larvae drop off the plant to the soil, where they form larval cocoons and pupate. Adults then emerge and repeat the cycle.

Soybean gall midge appears to go through two or three overlapping generations per season. The substantial overlap between generations makes it difficult to detect discrete generations within the growing season, and larvae can be present in an infested field continually over most of the growing season.

Soybean gall midge larvae.



Adult bean leaf beetles will feed on the outer pod tissue but not on the seed.

Galls and stem girdling from soybean gall midge feeding.

Crop Damage

Gall midge injury in soybean is a result of larval feeding, which occurs near the base of the plant. Multiple larvae can infest a plant. Larvae feed inside the stem, causing swelling and abnormal growth (galls). Infested portions of the stem will appear swollen and brown. Discolorations of the stem often begin near the soil surface and can extend up to the unifoliate node. Prolonged feeding can cause the stem to break off, resulting in plant death. Injury is generally most severe at field edges.

Identification

Larvae are very small and start out white, turning bright red or orange as they mature. Adult midges are small (2-3 mm in length) and have long antennae and hairy wings.

Management

Management recommendations for soybean gall midge are still being developed. The long emergence window of soybean gall midge adults poses a significant challenge for timing and effectiveness of insecticide application. Preliminary investigations into foliar insecticide treatments have shown some promise for suppressing gall midge populations when applied at the time of pre- or early post-emergence herbicide applications to control egg-laying adults.

Stink Bugs

Stink bugs can feed on pods and seeds of soybean plants. Several species of stink bug can infest soybean fields. The green stink bug, *Acrosternum hilare*, is the most common, but the brown stink bug, *Euschistus* spp., and brown marmorated stink bug (*Halyomorpha halys*) can also be found attacking soybean pods and seeds. Stink bugs are more of a problem in the southern states, and additional species are found there. This includes the southern green stink bug, *Nezara viridula* and the redbanded stink bug, *Piezodorus guildini*.

Lifecycle

Stink bugs go through a simple metamorphosis, which includes egg, nymph, and adult stages. During warm months, female stink bugs lay eggs which are stuck in clusters to leaves and stems. After hatching, the wingless nymphs molt several times before becoming full-sized, winged adults. Large nymphs or adults are the overwintering stage. Stink bugs normally complete only one life cycle per year in the northern states, one to three in Midwest, and two to five in the South, depending on species and location.

Crop Damage

Stink bug nymphs and adults primarily attack the pods and seeds of soybean plants, using their piercing and sucking mouthparts to inject digestive enzymes into the plant and remove pre-digested plant fluids. Their injury may be difficult to assess before harvest, because their mouth-parts leave no obvious feeding scars. However, at harvest the damage becomes obvious. Young seeds can be deformed, undersized or even aborted, and older seeds will be discolored and shriveled.

Stink bugs also feed on soybean plant stems, foliage, and blooms. On close examination, the location of feeding punctures can be identified by the presence of small brown or black spots.

Identification

Green stink bug adults are large (approximately 5/8 inch in length) and light green. Redbanded stink bugs are smaller (3/8 to 7/16 inch long) with a reddish band across the junction between the thorax and abdomen. Brown stink bugs have a brown mottled appearance. Brown marmorated stink bugs can be distinguished by distinct double white bands on their antennae and alternating light and dark banding along the edges of the abdomen.

Green stink bug.

Redbanded stink bug

Brown marmorated stink bug.

Brown stink bug.

Management

Scouting for stink bugs should begin when soybeans start to bloom and continue until maturity. Growers should intensify scouting and be ready for aggressive control in soybeans when corn begins to dry down, as stink bugs will move rapidly from corn into soybeans. This is especially true in southern areas, where corn matures ahead of soybeans. A widely-used insecticide threshold is one adult or later-stage nymph per foot of row as soybean pods begin to fill; however, treatment thresholds vary by species and state,

Two-Spotted Spider Mite

Two-spotted spider mite *(Tetranychus urticae)* is a pest of soybeans that proliferates during extended periods of drought. Dry conditions accelerate spider mite movement and reproduction and inhibit fungal pathogens that normally help keep spider mite populations in check. Economically damaging outbreaks of spider mites are relatively rare, but populations can grow rapidly when conditions are favorable.

The two-spotted spider mite is yellowish-green, light orange, or brown in color, and frequently with two dark lateral spots.

Lifecycle

Two-spotted spider mites have four stages of development: egg, larva, nymph and adult. Spider mites overwinter as adults in field edges and roadsides bordering fields, feeding on weeds until spring. After early spring mating, female spider mites lay eggs on weeds that usually hatch to the larval stage in 3 to 5 days. Adults are very small at only 1/60 (female) to 1/80 (male) inch in size when fully developed, with females laying an average of 50 to 100 eggs during their lifetime. The entire life cycle can be completed within 5 to 14 days, depending on environmental conditions. Fastest reproduction occurs when temperatures are over 85 °F (29 °C) and weather conditions are dry.

Crop Damage

Two-spotted spider mites damage crops by piercing plant leaves and feeding on the plant juices with their mouth parts. Mites suck on the bottom sides of soybean leaves and remove moisture and nutrient contents from plant cells, resulting in a yellow or whitish spotting on the top side of the leaf surface. In heavy infestations, a common visual symptom of spider mite feeding is leaf burning and stippling. Hot spots will typically be noticed first on field margins, as infested plants take on a wilted appearance. Drought-prone fields or field areas that contain lighter soils or sands are often affected first.

Soybean leaves showing spider mite feeding symptoms.

Identification

Mites are small arthropods related to insects that belong to the class Arachnida which also includes spiders and ticks. Unlike insects which have three main body parts and six legs, arachnids have two main body parts and eight legs. Two-spotted spider mites are barely visible with the naked eye. Doing a simple “paper test” is a quick and easy way to confirm their presence. Shaking the plant onto a white piece of paper should allow you to see the mites slowly moving on the paper.

Management

Chemical control of spider mites is challenging. While some pyrethroid products may suppress activity of spider mites, nearly all the synthetic pyrethroid products have a detrimental effect on spider mite predators. The lack of full control by pyrethroids allows mite numbers to increase unchecked or “flare up” when conditions are favorable.

Acknowledgements

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